NASA Glenn Success Stories

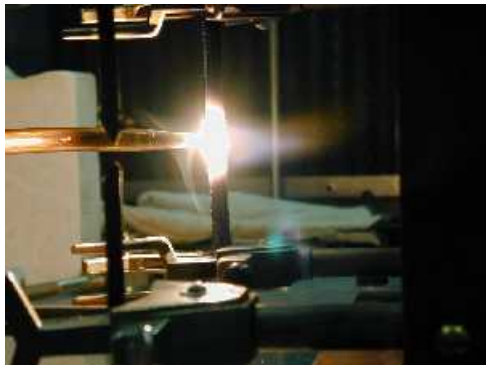
Rocket Motor Joint Construction Including Thermal Barrier

2004 NASA Government Invention of the Year Winner

Aerojet, ATK Thiokol Inc., and Lockheed-Martin

TECHNOLOGY

A unique braided carbon-fiber thermal barrier designed to withstand extreme temperature environments in current and future solid rocket motors (SRM). This revolutionary new thermal barrier solves the vexing problem of blocking 5500°F rocket combustion gases from reaching temperature-sensitive O-rings while still allowing 900 psi gases to position the O-rings in their grooves for proper sealing.



Thermal barrier seal shown undergoing a 5500°F oxyacetylene torch test at NASA Glenn Research Center

Location of Glenn thermal barriers on Shuttle Reusable Solid Rocket Motors

COMMERCIAL APPLICATION

◆Aerojet, manufacturer of the SRM's for Lockheed-Martin's Atlas V Evolved Expendable Launch Vehicle, used the Glenn thermal barrier technology to quickly overcome developmental difficulties with their SRM.

◆Aerojet incorporated three Glenn thermal barriers in their redesigned joint to meet an aggressive schedule to launch a commercial satellite. As a result, the first Atlas V mission successfully launched the Rainbow direct-to-home digital TV satellite in June 2003.

◆ Subsequent flights launched the AMC-16 satellite providing DISH Network service (December 2004) and the Inmarsat 4-F1 satellite delivering broadband communications to 86% of the world (March 11, 2005).

SOCIAL / ECONOMIC BENEFIT

The carbon-fiber thermal barrier is one of the best examples of how Glenn technology is critical to exploration, aerospace and commercial activities. Though developed for the space program there are many industrial applications anticipated for high temperature thermal barrier/seal technology. Some of these include sealing furnace doors to prevent the escape of superheated non-oxidizing gases, sealing graphitization furnaces, and sealing processing equipment in the chemical industry where high temperatures or corrosive environments disqualify polymeric or metal seals.

NASA APPLICATIONS

◆NASA used the Atlas V to successfully launch the Pluto Horizons spacecraft on January 19, 2006. The launch included 5 Aerojet boosters each incorporating six thermal barriers. NASA is also considering using Atlas V to launch payloads for the International Space Station, future Exploration Initiative missions and versions of the Crew Exploration Vehicle.

◆ATK Thiokol Inc. implemented the Glenn thermal barriers in the Shuttle Reusable Solid Rocket Motors. The new design promotes shuttle safety and allows nozzle joints to be assembled in one-sixth the time of previous approaches. The redesigned joint configuration has been approved by NASA for fabrication of flight motors. The new thermal barrier will enter service on Space Shuttle Mission STS-120, expected to launch in August 2007.

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